16. DC'S AND DR'S

1. The direction ratios of a bisector of the angle between two lines whose direction ratios are 1, 1, 2 and $\sqrt{3},-\sqrt{3},0$ are

[2020]

1. $1+\sqrt{3},1-\sqrt{3},2$ 2. $1-\sqrt{18},1+\sqrt{18},2$
3. $1-\sqrt{3},1-\sqrt{3},-2$ 4. 1, 1, 1

2. Which of the following is false?
   1) If (a,b, c) are direction ratios of a line, then $a^2+b^2+c^2 \neq 1$
   2) The direction cosines of a line can be its direction ratios but not vice-versa.
   3) If (l,m,n) is one set of direction cosines, then $(-l,-m,-n)$ is also a valid set.
   4) If (l_1,m_1,n_1) *and* (l_2,m_2,n_2) are direction cosines of perpendicular lines, then $l_1l_2+m_1m_2+n_1n_2=1$

[AP EAMCET 18-09-20_Shift-1]

1. 1 2. 2
3. 3 4. 4

3. The direction cosines of the vector $\vec{a}=-2\hat{i}+\hat{j}-5\hat{k}$ are **[AP EAMCET 21-09-20_Shift-1]**

1. $\frac{-2}{\sqrt{8}},\frac{1}{\sqrt{8}},\frac{-5}{\sqrt{8}}$ 2. $\frac{-2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{-5}{\sqrt{30}}$
3. $\frac{-2}{\sqrt{8}},\frac{-1}{\sqrt{8}},\frac{5}{\sqrt{8}}$ 4. $\frac{-2}{\sqrt{30}},\frac{-1}{\sqrt{30}},\frac{-5}{\sqrt{30}}$

4. If two lines are parallel to each other, then which of the following is true?
(if (l_1,m_1,n_1) *and* (l_2,m_2,n_2) are directioncosines of the two lines)

[AP EAMCET 21-09-20_Shift-2]

1. $l_1l_2+m_1m_2+n_1n_2=0$ 2. $\sum(l_1l_2-m_2m_1)^2=0$
3. $\frac{l_1}{l_2}=\frac{m_1}{m_2}=\frac{n_1}{n_2}$ 4. $l_1l_2+m_1m_2+n_1n_2=1$

5. Two lines whose direction cosines are given by $al+bm+cn=0$ and $fmn+gnl+hlm=0$ are perpendicular to each other if ______

[AP EAMCET 22-09-20_Shift-1]

1. $\frac{f}{a}+\frac{g}{b}+\frac{h}{c}=0$ 2. $\frac{f}{a}-\frac{g}{b}-\frac{h}{c}=0$
3. $\frac{f}{a}+\frac{g}{b}-\frac{h}{c}=0$ 4. $\frac{f}{a}-\frac{g}{b}+\frac{h}{c}=0$

6. The direction cosines of two lines are $\left(\frac{\sqrt{3}}{2},\frac{1}{4},\frac{\sqrt{3}}{4}\right)$ and $\left(\frac{-\sqrt{3}}{2},\frac{1}{4},\frac{\sqrt{3}}{4}\right)$. Then the angle between the lines is equal to _____

[AP EAMCET 22-09-20_Shift-2]

1. 30^0 2. 60^0
3. 45^0 4. 90^0

7. The angle between the lines with direction ratios (2,-2,1) and (1,-2,2) is ___

[AP EAMCET 23-09-20_Shift-1]

1. $\cos^{-1}(\frac{4}{9})$ 2. $\cos^{-1}(\frac{8}{9})$
3. $\frac{\pi}{6}$ 4. $\frac{\pi}{2}$

8. If $(a_1,b_1,c_1),(a_2,b_2,c_2)$ are the direction cosines of two lines making an angle θ with each other, then cosθ=**[AP EAMCET 23-09-20_Shift-1]**

1. $a_1a_2+b_1b_2+c_1c_2$
2. $|a_1a_2+b_1b_2+c_1c_2|$
3. $\frac{(a_1a_2+b_1b_2+c_1c_2)}{(\sqrt{a_1^2a_2^2+b_1^2b_2^2+c_1^2c_2^2})}$
4. $\frac{4}{3}$

9. If a line makes angles $\pi/3$, $\pi/4$ with positive x and y-axes respectively, then the angle made by the line with positive z-axis is

1. $\frac{\pi}{2}$ 2. $\frac{5\pi}{2}$

3. $\frac{\pi}{4}$ 4. $\frac{\pi}{3}$

10. If l,m,n are the direction cosines of a line which makes angles α,β and γ with the coordinates axes X,Y,Z respectively, then $lm+mn+nl$ takes maximum value when

[TS EAMCET 09-09-20_Shift-1]

1. α,β,γ are in arithmetic progression
2. $\alpha=\beta=\gamma$
3. Any two of α,β,γ are the same
4. One of α,β,γ is zero and the remaining two are non zero and unequal.

11. The angle between the lines whose direction ratios satisfy the equations $l+m+n=0$ and $l^2=m^2+n^2$ is

[TS EAMCET 09-09-20_Shift-2]

1. $\frac{\pi}{2}$ 2. $\frac{\pi}{3}$
3. $\frac{\pi}{4}$ 4. $\frac{\pi}{6}$

12. The direction cosines l,m,n of two lines are satisfying $3l+m+5n=0$ and $6mn-2nl+5lm=0$. If θ is the angle between those lines then $|\cos\theta|=$

[TS EAMCET 10-09-20_Shift-1]

1. $\frac{1}{\sqrt{6}}$ 2. $\frac{1}{\sqrt{2}}$
3. $\frac{1}{6}$ 4. $\frac{1}{\sqrt{3}}$

13. The direction cosine of the normal to the plane containing the lines having direction ratios 1,2,1 and 4,5,-3 are

[TS EAMCET 10-09-20_Shift-2]

1. $\frac{-11}{\sqrt{179}},\frac{7}{\sqrt{179}},\frac{-3}{\sqrt{179}}$ 2. $\frac{1}{\sqrt{2}},0,\frac{-1}{\sqrt{2}}$
3. $\frac{5}{\sqrt{41}},\frac{-4}{\sqrt{41}},0$ 4. $\frac{2}{\sqrt{5}},\frac{-1}{\sqrt{5}},0$

14. $E(1,0,0),F(0,2,0),G(0,0,3)$ are respectively the mid point of the sides AB,BC,CA of ΔABC .if a_1,b_1,c_1 and a_2,b_2,c_2 are respectively the direction ratios of AF and BG, then $\frac{a_1^2+b_1^2+c_1^2}{a_2^2+b_2^2+c_2^2}=$

[TS EAMCET 11-09-20_Shift-1]

1. $\frac{26}{41}$ 2. $\frac{13}{26}$
3. $\frac{17}{43}$ 4. $\frac{13}{43}$

15. If the direction ratios a,b,c of a line L satisfy the relations ab + bc + ca = 0 and 6ab + 9bc + 8ca = 0, then the direction cosines of the line L are

[TS EAMCET 11-09-20_Shift-1]

1. $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$ 2. $\frac{2}{\sqrt{7}},\frac{1}{\sqrt{7}},\frac{-2}{\sqrt{7}}$
3. $\frac{-1}{\sqrt{6}},\frac{\sqrt{3}}{\sqrt{6}},\frac{\sqrt{2}}{\sqrt{6}}$ 4. $\frac{-3}{7},\frac{2}{7},\frac{-6}{7}$

16. **Assertion(A):** The direction ratios of line L_1 are 2,5,7 and those of line L_2 are $\frac{4}{\sqrt{19}},\frac{10}{\sqrt{19}},\frac{14}{\sqrt{19}}$.

The lines L_1,L_2 are parallel.

Reason(R): The direction ratios of a line L_1 are (a_1,b_1,c_1) and those of another line L_2 are (a_2,b_2,c_2)

The lines L_1,L_2 are parallel if $a_1a_2+b_1b_2+c_1c_2=0$

[TS EAMCET 11-09-20_Shift-2]

1. (A) is true,(R) is true and (R) is the correct explanation for (A)
2. (A) is true, (R)is true but (R) is not the correct explanation for (A)
3. (A) is true but (R) is false
4. (A) is false but (R) is true

17. The direction cosines of a line which makes equal angles with the co-ordinate axes are__

[AP EAMCET 19-08-2021_Shift-1]

1. $\left(\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$ 2. $\left(\frac{-1}{\sqrt{3}},\frac{-1}{\sqrt{3}},\frac{-1}{\sqrt{3}}\right)$

3. $\left(\frac{\pm1}{\sqrt{3}},\frac{\pm1}{\sqrt{3}},\frac{\pm1}{\sqrt{3}}\right)$ 4. $\left(\frac{12}{13},\frac{5}{13},0\right)$

18. Let 'O' be the origin and 'P' be a point which is at a distance of 3 units from the origin. If the direction ratios of $\overline{OP}$ are $(1,-2,-2)$, then the coordinates of 'P' are___

[AP EAMCET 19-08-2021_Shift-1]

1. $(1,-2,-2)$ 2. $(3,-6,-6)$

3. $\left(\frac{1}{3},\frac{-2}{3},\frac{-2}{3}\right)$ 4. $\left(\frac{1}{9},\frac{-2}{9},\frac{-2}{9}\right)$

19. $A(-1,2,-3), B(5,0,-6), C(0,4,-1)$ are the vertices of a triangle ABC. The direction cosines of internal bisectors of $\angle BAC$ are____

[AP EAMCET 19-08-2021_Shift-2]

1. $\frac{25}{\sqrt{714}},\frac{8}{\sqrt{714}},\frac{-5}{\sqrt{714}}$

2. $\frac{25}{\sqrt{714}},\frac{8}{\sqrt{714}},\frac{5}{\sqrt{714}}$

3. $\frac{5}{\sqrt{74}},\frac{6}{\sqrt{74}},\frac{8}{\sqrt{74}}$ 4. $\frac{-5}{\sqrt{74}},\frac{6}{\sqrt{74}},\frac{-8}{\sqrt{74}}$

20. If the projections of the line segment $\overline{AB}$ on XY, YZ and ZX planes are $\sqrt{15},\sqrt{46},7$ respectively, then the projection of $\overline{AB}$ on x-axis is__ **[AP EAMCET 19-08-2021_Shift-2]**

1. 9 2. 3

3. 4 4. 7

21. If the direction cosines of two lines are $\left(\frac{2}{3},\frac{2}{3},\frac{1}{3}\right)$ and $\left(\frac{5}{13},\frac{12}{13},0\right)$, then identify the direction ratios of the line which is bisecting one of the angle between them.

[AP EAMCET 20-08-2021_Shift-1]

1. $(40,60,13)$ 2. $(41,60,10)$

3. $(41,62,13)$ 4. $(1,2,3)$

22. The direction cosines of the line joining the points $(-2,4,-5)\&(1,2,3)$ are

[AP EAMCET 20-08-2021_Shift-2]

1. $\left(\frac{3}{\sqrt{77}},\frac{-2}{\sqrt{77}},\frac{8}{\sqrt{77}}\right)$ 2. $\left(\frac{3}{\sqrt{77}},\frac{2}{\sqrt{77}},\frac{8}{\sqrt{77}}\right)$

3. $(1,0,0)$ 4. $\left(\frac{-3}{77},\frac{-2}{77},\frac{8}{77}\right)$

23. If the line joining the points $A(7,p,2)\&B(q,-2,5)$ is parallel to the line joining the points $C(2,-3,5)\&D(-6,-15,11)$, then the value of $p^2+q^2=$

[AP EAMCET 23-08-2021_Shift-1]

1. 25 2. 16

3. 9 4. 7

24. If a line makes angles $90°,135°$ and $45°$ with the positive x,y and z axes respectively, then its direction cosines are ________

[AP EAMCET 23-08-2021_Shift-2]

1. $\left\langle 0,\frac{1}{2},\frac{1}{\sqrt{2}}\right\rangle$ 2. $\left\langle 0,\frac{-1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right\rangle$

3. $\left\langle 1,\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right\rangle$ 4. $\left\langle 1,\frac{-1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right\rangle$

25. The angle between the lines whose direction cosines are given by the equations

$l^2+m^2-n^2=0, l+m+n=0$ is ______

[AP EAMCET 24-08-2021_Shift-1]

1. $\frac{\pi}{6}$ 2. $\frac{\pi}{4}$
3. $\frac{\pi}{3}$ 4. $\frac{\pi}{2}$

26. If the direction cosines of a straight line are $\left(\frac{1}{c},\frac{1}{c},\frac{1}{c}\right)$, then c = ______

[AP EAMCET 24-08-2021_Shift-2]

1. $\pm\sqrt{2}$ 2. $\pm\sqrt{3}$
3. ± 2 4. ± 3

27. If the direction ratios of two lines are given by $3lm-4ln+mn=0$ and $l+2m+3n=0$, then the angle between the lines is ______

[AP EAMCET 25-08-2021_Shift-2]

1. $\frac{\pi}{2}$ 2. $\frac{\pi}{3}$
3. $\frac{\pi}{4}$ 4. $\frac{\pi}{6}$

28. The direction cosines of the line passing through $P(2,3,-1)$ and the origin are

[TS EAMCET 04-08-2021_Shift-2]

1. $\frac{2}{\sqrt{14}},\frac{3}{\sqrt{14}},\frac{1}{\sqrt{14}}$ 2. $\frac{2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{1}{\sqrt{14}}$
3. $\frac{-2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{1}{\sqrt{14}}$ 4. $\frac{2}{\sqrt{14}},\frac{-3}{\sqrt{14}},\frac{-1}{\sqrt{14}}$

29. The direction cosines of the line making angles $\frac{\pi}{4},\frac{\pi}{3}$ and $\theta\left(0<\theta<\frac{\pi}{2}\right)$ respectively with x, y andz axes, are

[TS EAMCET 04-08-2021_Shift-1]

1. $\frac{1}{\sqrt{2}},\frac{1}{2},\frac{1}{2}$ 2. $\frac{1}{\sqrt{2}},\frac{1}{2},\frac{\sqrt{3}}{2}$
3. $\frac{1}{\sqrt{2}},\frac{1}{2},\frac{1}{\sqrt{2}}$ 4. $\frac{1}{\sqrt{2}},\frac{\sqrt{3}}{2},\frac{1}{\sqrt{2}}$

30. Suppose L_1 *and* L_2 are two lines having the direction ratios $1,-2,-2$ *and* $0,2,1$ respectively. If the direction cosines of a line perpendicular to both L_1 *and* L_2 are l,m,n then $|l|+|m|+|n|=$

[TS EAMCET 05-08-2021_Shift-1]

1. 3 2. $\frac{5}{3}$
3. $\sqrt{3}$ 4. $\frac{7}{3}$

31. If $(2,-1,2)$ and $(K,-3,-5)$ are the triads of direction ratios of two lines and the angle between the lines is 60^0, then

[TS EAMCET 05-08-2021_Shift-2]

1. $K^2-56K-208=0$ 2. $5K^2-110K+112=0$
3. $7K^2-112K-110=0$ 4. $7K^2-112K+110=0$

32. If 1,2,3 and $-1,0,1$ are the direction ratios of the rays $\overline{OA}$ and $\overline{OB}$ respectively, then the direction cosines of a normal to the plane AOB are

[TS EAMCET 06-08-2021_Shift-2]

1. $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{-1}{\sqrt{3}}$ 2. $\frac{2}{3},\frac{-2}{3},\frac{1}{3}$
3. $\frac{-1}{\sqrt{6}},\frac{2}{\sqrt{6}},\frac{-1}{\sqrt{6}}$ 4. $\frac{-3}{13},\frac{4}{13},\frac{12}{13}$

33. The direction cosines of the supporting line of the vector $\bar{i}+\bar{j}-2\bar{k}$ are

[TS EAMCET 06-08-2021_Shift-1]

1. $\left(\frac{1}{\sqrt{6}},\frac{1}{\sqrt{6}},\frac{-2}{\sqrt{6}}\right)$ 2. $\left(\frac{1}{2},\frac{1}{2},-1\right)$
3. $\left(\frac{1}{\sqrt{6}},\frac{1}{\sqrt{6}},\frac{2}{\sqrt{6}}\right)$ 4. $\left(\frac{-1}{2},\frac{-1}{2},-1\right)$

34. Suppose the distance of a point P from the origin O is 63. If the direction ratios of the line OP are (3, -2,6) then the coordinates of the point P is **[TS EAMCET 06-08-2021_Shift-1]**

1. $(-27,18,54)$ 2. $(27,-18,-54)$
3. $(27,-18,54)$ 4. $(-27,-18,-54)$

35. If (a, b, c) are the direction ratios of a line joining

the points (4, 3, –5) and (–2, 1, –8) then the point P (a, 3b, 2c) lies on the plane

[AP EAMCET 04-07-2022_Shift-1]

1. $x+y+z=0$
2. $x+y-2z=0$
3. $x+2y+3z=0$
4. $x-2y+3z=0$

36. If (2,3,c) are the direction ratios of a ray passing through the point C(5,q,1) and also the midpoint of the line segment joining the points A(p,-4,2) and B(3,2,-4) then c.(p+7q)=

[AP EAMCET 04-07-2022_Shift-2]

1. 17
2. 34
3. 21
4. 28

37. If the direction cosines of a line are $\left(\frac{a}{\sqrt{83}},\frac{5}{\sqrt{83}},\frac{c}{\sqrt{83}}\right)$ and c–a=4 then ca =

[AP EAMCET 05-07-2022_Shift-1]

1. 24
2. 21
3. 18
4. 33

38. If $\alpha, 2\alpha, 3\alpha$ are angles made by a ray with OX, OY, OZ axes respectively then all the possible values of α are

[AP EAMCET 05-07-2022_Shift-2]

1. $\frac{\pi}{6},\frac{\pi}{12}$
2. $\frac{\pi}{6},\frac{\pi}{3}$
3. $\frac{\pi}{4},\frac{\pi}{3}$
4. $\frac{\pi}{6},\frac{\pi}{4}$

39. If a,b,c are the direction ratios of a line L and l, m, n are its direction cosines, then $\frac{a^2}{b^2+c^2}=$

[AP EAMCET 06-07-2022_Shift-1]

1. $\frac{1-l^2}{l^2}$
2. $\frac{l^2}{1+l^2}$
3. $\frac{l^2}{l^2+m^2}$
4. $\frac{l^2}{1-l^2}$

40. If (l_1,m_1,n_1) *and* (l_2,m_2,n_2) *are* the direction cosines of two lines satisfying the relations $l^2+mn-6n^2=0$ *and* $2l-m+3n=0$, *then* $|l_1l_2|+|m_1m_2|=$

[AP EAMCET 06-07-2022_Shift-2]

1. $\frac{16}{3\sqrt{57}}$
2. $\frac{2\sqrt{3}}{\sqrt{19}}$
3. $\frac{4}{3\sqrt{57}}$
4. $\frac{19}{3\sqrt{57}}$

41. Suppose (l_1,m_1,n_1) and (l_2,m_2,n_2) are the directional cosines of two lines and θ is the angle between them $\cos\theta=\pm(l_1l_2+m_1m_2+n_1n_2)$. Let A=(1,-2,3),B=(3,1,-3) and C=(-3,1,3) be the vertices of a triangle ABC. Then cos A=

[AP EAMCET 07-07-2022_Shift-1]

1. $\frac{-1}{35}$
2. $\frac{1}{7}$
3. $-\frac{1}{7}$
4. $\frac{1}{35}$

42. A ray makes angles $\frac{\pi}{3}$ *and* $\frac{\pi}{4}$ with Y and Z-axes respectively. Then the value of the sine of the angle made by the ray with X-axis is

[AP EAMCET 07-07-2022_Shift-2]

1. $\frac{\sqrt{3}}{2}$
2. $\frac{1}{2}$
3. $\frac{1}{\sqrt{2}}$
4. 1

43. If the direction cosines of a line satisfy the relations l-m+n = 0 and lm+mn-4nl = 0, then the direction cosines of the line are

[AP EAMCET 08-07-2022_Shift-2]

1. $\left(\frac{-1}{\sqrt{6}},\frac{2}{\sqrt{6}},\frac{1}{\sqrt{6}}\right)$ 2. $\left(\frac{1}{\sqrt{6}},\frac{-2}{\sqrt{6}},\frac{1}{\sqrt{6}}\right)$

3. $\left(\frac{1}{\sqrt{6}},\frac{2}{\sqrt{6}},\frac{-1}{\sqrt{6}}\right)$ 4. $\left(\frac{1}{\sqrt{6}},\frac{2}{\sqrt{6}},\frac{1}{\sqrt{6}}\right)$

44. If a line L is common to the planes $x - y + z + 2 = 0$ and $2x + y - 2z + 5 = 0$ then the direction cosines of the line L are

[TS EAMCET 18-07-2022_Shift-1]

1. $\left(\frac{1}{\sqrt{26}},\frac{4}{\sqrt{26}},\frac{3}{\sqrt{26}}\right)$ 2. $\left(\frac{1}{3},\frac{2}{3},\frac{2}{3}\right)$

3. $\left(\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$ 4. $\left(\frac{-1}{6},\frac{5}{6},\frac{\sqrt{10}}{6}\right)$

45. Let A(2,5,7) be the image of the point B(1,–2,3) with respect to plane π. Let C be the point where AB meets the plane π. Let D=(2,1,6). That then direction cosines of CD are **[TS EAMCET 19-07-2022_Shift-2]**

1. $\frac{1}{\sqrt{11}},\frac{3}{\sqrt{11}},\frac{-1}{11}$ 2.

3. $\frac{3}{\sqrt{46}},\frac{-1}{\sqrt{46}},\frac{6}{\sqrt{46}}$ 4. $\frac{1}{\sqrt{14}},\frac{2}{14},\frac{3}{\sqrt{14}}$

46. Let $A(2,3,-1)$, $B(4,1,0)$, $C(-1,-1,11)$ be the vertices of a triangle ABC. Let D be the point where the bisector of $\underline{|BAC}$ meet the side BC. Then the direction ratios of AD are

[TS EAMCET 20-07-2022_Shift-1]

1. (35,–19,49) 2. (17,–14,49)

3. (17,–38,49) 4. (17,–38,23)

47. If the dr's of two lines are connected by the relations $a-b+c=0$, $a^2-b^2+2c^2=0$ and θ is the angle between these lines then cosθ=

[TS EAMCET 20-07-2022_Shift-2]

1. $\frac{2}{\sqrt{7}}$ 2. $\frac{3}{2\sqrt{7}}$

3. $\frac{3}{4\sqrt{2}}$ 4. $\frac{1}{3\sqrt{2}}$

48. Let A(1,1,2),B(6,11,2) ,C(1,2,6) be three points. If l_1,m_1n_1 are the direction cosines of AB and l_2,m_2,n_2 are the direction cosines of AC, then $|l_1l_2+m_1m_2+n_1n_2|=$

[16th May 2023 Shift 1]

1. $\frac{63}{65}$ 2. $\frac{36}{65}$

3. $\frac{16}{65}$ 4. $\frac{13}{64}$

49. If $(\ell_1,m_1,n_1),(\ell_2,m_2,n_2)$ are the direction cosines of two lines, then $(\ell_1m_2-\ell_2m_1)^2+(m_1n_2-m_2n_1)+(n_1l_2-n_2l_1)^2+(l_1l_2+m_1m_2+n_1n_2)^2=$

[16th May 2023 Shift 2]

1. 0 2. 1

3. 2 4. 4

50. If a line L makes angles $\frac{\pi}{3}$ and $\frac{\pi}{4}$ with the positive X-axis and positive Y-axis respectively, then the angle made by L with the positive direction of Z-axis is **[18th May 2023 Shift 2]**

1. $\frac{\pi}{2}$ 2. $\frac{\pi}{3}$

3. $\frac{\pi}{4}$ 4. $\frac{5\pi}{12}$

51. If a straight line is equally inclined at an angle θ with all the three coordinates axes, then $\tan\theta=$ **[19th May 2023 Shift 1]**

1. $2\sqrt{2}$ 2. $\sqrt{2}$

3. 1 4. $1+\sqrt{5}$

52. If the direction cosines (l,m,n) of two lines are connected by the relations

$l+m+n=0$ *and* $lm=0$, then the angle between those lines is

[12[TH] MAY 2023 SHIFT-1]

1. $\frac{\pi}{3}$
2. $\frac{\pi}{4}$
3. $\frac{\pi}{2}$
4. $\frac{\pi}{6}$

53. Consider the following statements:
Assertion (A) : The direction ratio of a line L_1 are 2,5,7 and the direction ratios of another line L_2 are $\frac{4}{\sqrt{19}},\frac{10}{\sqrt{19}},\frac{14}{\sqrt{19}}$. Then the lines L_1, L_2 are parallel
Reason (R) : If the direction ratios of a line L_1 are a_1,b_1,c_1 and the direction ratios of a line L_2 are a_2,b_2,c_2 and $a_1a_2+b_1b_2+c_1c_2=0$, then the lines of L_1, L_2 are parallel

[12[TH] MAY 2023 SHIFT -2]

1.(A) and (R) are true. (R) is the correct explanation of (A)
2.(A) and (R) are true ,but (R) is not the correct explanation of (A)
3.(A) is true, (R) is false
4.(A) is false,(R) is true

54. Let the direction cosines of two lines satisfy the equations $3l+2m+n=0$ and $2mn-3nl+5lm=0$ .If θ is the angle between these two lines, then $\cos\theta =$

[13[TH] MAY 2023 SHIFT-1]

1. $\sqrt{\frac{19}{28}}$
2. $\frac{3}{\sqrt{28}}$
3. $\frac{25}{\sqrt{2991}}$
4. $\frac{1}{6}$

55. If l,m,n and a,b,c are direction cosines of two lines then **[EAPCET 14-05-23 SHIFT-1]**
1.They are parallel when $la+mb+nc=0$
2.They are perpendicular when $\frac{l}{a}=\frac{m}{b}=\frac{n}{c}$
3.The direction ratios of the bisectors of the angles between the two lines are $l\pm a, m\pm b, n\pm c$
4.The direction ratios of the bisectors of the angles between the two lines are $la, mb.nc$

56. If the image of the point (1,-2,1) with respect to the line passing through the points B (1, 1, 2) and C (2, 2, 1) is (l, m, n), then $l^2+m^2+n^2=$ **[EAPCET 13-05-23 SHIFT-2]**
1. 1
2. 9
3. 22
4. 26

KEY

1)	1	2)	4	3)	2	4)	3	5)	1
6)	2	7)	2	8)	2	9)	4	10)	2
11)	2	12)	3	13)	1	14)	1	15)	4
16)	3	17)	3	18)	1	19)	2	20)	2
21)	3	22)	1	23)	1	24)	2	25)	3
26)	2	27)	1	28)	3	29)	1	30)	2
31)	3	32)	3	33)	1	34)	3	35)	2
36)	2	37)	2	38)	4	39)	4	40)	2
41)	4	42)	1	43)	4	44)	1	45)	2
46)	3	47)	1	48)	2	49)	2	50)	2
51)	2	52)	1	53)	3	54)	3	55)	3
56)	4								

SOLUTIONS

1. $d.r's\ \ 1,1,2 \Rightarrow d.c's\ \ \frac{1}{\sqrt{6}},\frac{1}{\sqrt{6}},\frac{2}{\sqrt{6}}$

$d.r's\ \ \sqrt{3},-\sqrt{3},0 \Rightarrow d.c's\ \ \frac{1}{\sqrt{2}},-\frac{1}{\sqrt{2}},0$

The dr's of the bisector of the angle between the two lines

$l_1+l_2, m_1+m_2, n_1+n_2$

$\frac{1}{\sqrt{6}}+\frac{1}{\sqrt{2}},\frac{1}{\sqrt{6}}-\frac{1}{\sqrt{2}},\frac{2}{\sqrt{6}}$

$\Rightarrow \frac{\sqrt{2}+\sqrt{6}}{\sqrt{2}\sqrt{6}},\frac{\sqrt{2}-\sqrt{6}}{\sqrt{2}\sqrt{6}},\frac{2}{\sqrt{6}}$

$\Rightarrow 1+\sqrt{3}, 1-\sqrt{3}, 2$

2. Conceptual

3. Dr's are -2,1,-5

Dc's $= \frac{-2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{-5}{\sqrt{30}}$

4. We know that two lines are parallel then condition is

$$\frac{l_1}{l_2}=\frac{m_1}{m_2}=\frac{n_1}{n_2}$$

5. Conceptual

6. $\cos\theta=\left|\frac{-3}{4}+\frac{1}{16}+\frac{3}{16}\right|=\frac{1}{2}\Rightarrow\theta=60^0$

7. $\cos\theta=\frac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}}=\frac{8}{9}$

$$\theta=\cos^{-1}\left(\frac{8}{9}\right)$$

8. $\cos\theta=|a_1a_2+b_1b_2+c_1c_2|$

9. $\alpha=\pi/3,\ \beta=\pi/4,\ \gamma=?$

We know that,

$$\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$$

$$\cos^2\left(\frac{\pi}{3}\right)+\cos^2\left(\frac{\pi}{4}\right)+\cos^2\gamma=1$$

$$\frac{1}{4}+\frac{1}{2}+\cos^2\gamma=1$$

$$\cos\gamma=\frac{1}{2}$$

$$\gamma=\frac{\pi}{3}$$

10. If $\alpha=\beta=\gamma$

Then $l^2+m^2+n^2=1$

$lm+mn+nl=l^2+m^2+n^2=1$

$\therefore lm+mn+nl$ is maximum if $\alpha=\beta=\gamma$

11 Conceptual

12. $m=-3l-5n$.........(1)

$$6(-3l-5n)-2nl+5l(-3l-5n)=0$$

$$l^2+3ln+2n^2=0$$

$$(l+2n)(l+n)=0$$

$$l=-2n$$

$$m=-3(-2n)-5n=n$$

$$l:m:n=-2:1:1$$

$$l=-n$$

$$m=-3(-n)-5n=-2n$$

$$l:m:n=-1:-2:1$$

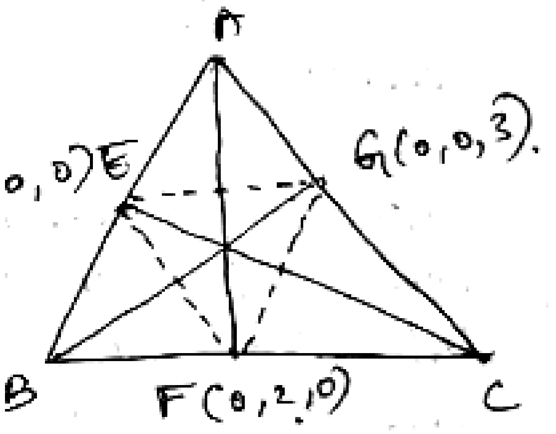
$$\cos\theta=\frac{2-2+1}{\sqrt{4+1+1}\sqrt{4+1+1}}=\frac{1}{6}$$

13. Dr's are $(-11,7,-3)$

$\therefore$ dc's are $\left(\frac{-11}{\sqrt{179}},\frac{7}{\sqrt{179}},\frac{-3}{\sqrt{179}}\right)$

14. We can find vertices

$A(1,-2,3);B(1,2,-3);C(0,2,0)$



Now, dr's of AF $(a_1,b_1,c_1)=(1,-4,3)$

dr's of BG $(a_2,b_2,c_2)=(1,2,-6)$

now, $\frac{a_1^2+b_1^2+c_1^2}{a_2^2+b_2^2+c_2^2}=\frac{26}{41}$

15. Given relations

$ab+bc+ca=0$.....(1) and

$6ab+9bc+8ca=0$....(2)

Solving (1) and (2) we get

$a:b=-2:3; b:c=-1:3$

$c:a=2:1$

$a:b:c=3k:-2k:6k=3:-2:6$

Direction cosines of $(a,b,c)=\left(\frac{-3}{7},\frac{2}{7},\frac{-6}{7}\right)$

16. D's of a line L_1 are $(2,5,7)$

D's of a line L_2 are $(2,5,7)$

L_1 and L_2 are parallel.

Statement-1 is true and statement-2 is false.

17. Given $\alpha=\beta=\gamma$

w.k.t $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

$\Rightarrow \cos^2\alpha=\frac{1}{3}\Rightarrow \cos\alpha=\pm\frac{1}{\sqrt{3}}$

The dc's are $\left(\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}}\right)$

18. Given $o(0,0,0)$, $p(x,y,z)$

$op=3\Rightarrow x^2+y^2+z^2=9$

And dr's $\overline{op}$ is

$(x,y,z)=(1,-2,-2)$

$\therefore p=(1,-2,-2)$

19. $AB=7,\ AC=3$

D= divides BC in the ratio $7:3$

$D=\left(\frac{3}{2},\frac{14}{5},\frac{-5}{2}\right)$

dr's of AD=$\left(\frac{5}{2},\frac{4}{5},\frac{1}{2}\right)$

dc's of AD=$\left(\frac{25}{\sqrt{714}},\frac{8}{\sqrt{714}},\frac{5}{\sqrt{714}}\right)$

20. Let (x_1,y_1,z_1) and (x_2,y_2,z_2)

$AB=l=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$

15=projection on XY-plane =

$(x_2-x_1)^2+(y_2-y_1)^2$

46=projection on YZ-plane=

$(y_2-y_1)^2+(z_2-z_1)^2$

49=projection on ZX-plane=

$(x_2-x_1)^2+(z_2-z_1)^2$

$2\left[\left((x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2\right)\right]=110$

$\left((x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2\right)=55$

The projection on X-axis is $|x_2-x_1|^2=9$

$x_2-x_1=3$

21. The dc's are $\left(\frac{2}{3},\frac{2}{3},\frac{1}{3}\right)$ and $\left(\frac{5}{13},\frac{12}{13},0\right)$

The dc's of angular bisector is =

$\left(\frac{2}{3}+\frac{5}{13},\frac{2}{3}+\frac{12}{13},\frac{1}{3}\right)$

The dr's are $(41,62,13)$

22. $A(-2,4,-5)$ $B(1,2,3)$

dr;s of AB=$(3,-2,8)$

dc,s of AB=$\left(\frac{3}{\sqrt{77}},\frac{-2}{\sqrt{77}},\frac{8}{\sqrt{77}}\right)$

23. $A(7,p,2)$ and $B(q,-2,5)$

d.r's of AB=$(q-7,-2-p,3)$

$C=(2,-3,5),\ D=(-6,-15,11)$

d.r's of CD=$(-8,-12,6)=(-4,-6,3)$

$\therefore AB//CD$

$\Rightarrow q-7=-4 \quad -2-p=-6$

$q=3 \quad p=4$

$p^2+q^2=25$

24. $\alpha=90^0$ $\beta=135^0$ $\gamma=45^0$

$\cos\alpha=0$ $\cos\beta=\frac{-1}{\sqrt{2}}$ $\cos\gamma=\frac{1}{\sqrt{2}}$

The d.c's are $\left(0,\frac{-1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$

25. $l=-m-n$

$(m+n)^2+m^2-n^2=0$

$2m^2+2mn=0$

$m=0,l=-n$

$m=-n,l=0$

$(l_1,m_1,n_1)=(-1,0,1)$

$(l_2,m_2,n_2)=(0,-1,1)$

$\cos\theta=\frac{|0+0+1|}{\sqrt{1+1}\sqrt{1+1}}=\frac{1}{2}\Rightarrow\theta=60^0$

26. $\cos\alpha=\frac{1}{c},\cos\beta=\frac{1}{c},\cos\gamma=\frac{1}{c}$

$l^2+m^2+n^2=1$

$\frac{1}{c^2}+\frac{1}{c^2}+\frac{1}{c^2}=1\Rightarrow c=\pm\sqrt{3}$

27. $3lm-4ln+mn=0........(1)$

$l+2m+3n=0.......(2)$

$l=-2m-3n\Rightarrow m=\pm\sqrt{2}n$

$m=\sqrt{2}n$ $\quad$ $m=-\sqrt{2}n$

$l=\left(-2\sqrt{2}-3\right)n$ $\quad$ $l=\left(2\sqrt{2}-3\right)n$

$l_1l_2+m_1m_2+n_1n_2=(8-9)-2+1=0\Rightarrow\theta=\frac{\pi}{2}$

28. $O(0,0,0),P(2,3,-1)$

Dr's of OP are $(2,3,-1)$

Dr's of OP are $\pm\left(\frac{2}{\sqrt{14}},\frac{3}{\sqrt{14}},\frac{-1}{\sqrt{14}}\right)$

29. Given $\alpha=\frac{\pi}{4},\beta=\frac{\pi}{3}$

$\therefore\cos^2\alpha+\cos^2\beta+\cos^2\theta=1$

$\Rightarrow\frac{1}{2}+\frac{1}{4}+\cos^2\theta=1\Rightarrow\cos\theta=\frac{1}{2}$

$D.C's\ are\ \frac{1}{\sqrt{2}},\frac{1}{2},\frac{1}{2}$

30. Let (a,b,c) be the dr's of line $\perp^r$ to both L_1 and L_2.

Dr's of $L_1(a_1,b_1,c_1)=(1,-2,-2)$

Dr's of $L_2(a_2,b_2,c_2)=(0,2,1)$

The line is $\perp^r$ to L_1 $\therefore aa_1+bb_1+cc_1=0$

$a-2b-2c=0....(1)$

The line is $\perp^r$ to L_2

$0+2b+c=0$

$2b+c=0......(2)$

	a	b	c	
−2	−2	1		−2
2	1	0		2

$\frac{a}{2}=\frac{b}{-1}=\frac{c}{2}$

Dr's of line $(a,b,c)=(2,-1,2)$

Dc's $(l,m,n)=\left(\frac{2}{3},\frac{-1}{3},\frac{2}{3}\right)$ $\therefore|l|+|m|+|n|=\frac{5}{3}$

31. $\cos\theta=\frac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}}$

$\cos60^\circ=\frac{2k+3-10}{\sqrt{4+1+4}\sqrt{k^2+9+25}}$

$\frac{1}{2}=\frac{2k-7}{3\sqrt{k^2+34}}$

$3\sqrt{k^2+34}=2(2k-7)$

Squaring on both sides

$9\left(k^2+34\right)=4(2k-7)^2$

$9k^2+306=16k^2+196-112k$

$7k^2-112k-110=0$

32. $d.r's$ of $\overline{OA}$ are 1,2,3

$d.r's$ of $\overline{OB}$ are $-1,0,1$

The $d.r's$ of normal to the plane $\overline{AOB}$ are

$$\begin{matrix} 2 & 3 & 1 & 2 \\ 0 & 1 & -1 & 0 \end{matrix}$$

$$\frac{a}{2}=\frac{b}{-4}=\frac{c}{2}$$

$$\Rightarrow \frac{a}{1}=\frac{b}{-2}=\frac{c}{1}=\frac{a}{-1}=\frac{b}{2}=\frac{c}{-1}$$

$d.r's$ of a,b,c are $\left(\frac{-1}{\sqrt{6}},\frac{2}{\sqrt{6}},\frac{-1}{\sqrt{6}}\right)$.

33. Given $\overline{i}+\overline{j}-2\overline{k}$

The d.r's are $(1,1,-2)$

d.c's are $\left(\frac{1}{\sqrt{6}},\frac{1}{\sqrt{6}},\frac{-2}{\sqrt{6}}\right)$

34. B.V.M option (3), $P(27,-18,54)$

Now OP distance $=\sqrt{(27)^2+(-18)^2+(54)^2}$

$=\sqrt{3969}=63$

35. Dr of $\overline{AB}=6,2,3=a,b,c$

$\because P(a,3b,2c)=p(6,6,6)$

by verification, $x+y-2z=0$

opt - 2 $\quad 6+6-12=0$

$0=0$

36. $D\left(\frac{p+3}{2},-1,-1\right)$

Dr of $\overline{CD}$ = $\left(\frac{p-7}{2},-1-q,-2\right)$

$$\frac{2}{\frac{p-7}{2}}-\frac{3}{-1-q}=\frac{c}{-2}$$

$$\underset{(1)}{\frac{4}{p-7}}=\underset{(2)}{\frac{3}{-1-2}}=\underset{(3)}{\frac{c}{-2}}$$

$(1)=(2)$

$-4-4q=3p-21=3(p-7)$.....(4)

$(1)=(3)$

$$\frac{4}{p-7}=\frac{c}{-2}$$

$-8=pc-7c$

$-8=c(P-7)$

$-8+7c=pc$ ....(5)

$(4)=(5)$

$$\frac{-4-4q}{-8}=\frac{3}{c}$$

$$\frac{4+4q}{8}=\frac{3}{c}$$

$$\frac{1+q}{2}=\frac{3}{c}$$

$c(1+q)=6$

$qc=6-c$

$c(p+7q)=pc+7qc$

$=-8+7c+7(6-c)$

$=-8+7c+42-7c$

$=34$

37. $l^2+m^2+n^2=1$

$$\frac{a^2}{83}+\frac{25}{83}+\frac{c^2}{83}=1$$

$a^2+c^2+25=83$

$$a^2+c^2=58$$

$\because c-a=4$

$a^2+c^2=58$

$(a-c)^2+2ac=58$

$16+2ac=58$

$2ac=42$

$ac=21$

38. $\cos^2\alpha+\cos^2 2\alpha+\cos^2 3\alpha=1$

by verification.

$\alpha=\pi/6$

$\left(\frac{\sqrt{3}}{2}\right)^2+\left(\frac{1}{2}\right)^2+0=1$

1=1

put $\alpha=\pi/4$

$\left(\frac{1}{\sqrt{2}}\right)^2+0+\left(\frac{1}{\sqrt{2}}\right)^2$

$\frac{1}{2}+\frac{1}{2}=1$

$1=1$

39. d.r's a,b,c

$dc's(l,m,n)=\frac{a}{\sqrt{a^2+b^2+c^2}},\frac{b}{\sqrt{a^2+b^2+c^2}},\frac{c}{\sqrt{a^2+b^2+c^2}}$

$$\frac{l^2}{1-l^2}=\frac{\frac{a^2}{a^2+b^2+c^2}}{1-\frac{a^2}{a^2+b^2+c^2}}=\frac{\frac{a^2}{a^2+b^2+c^2}}{\frac{a^2+b^2+c^2-a^2}{a^2+b^2+c^2}}$$

$=\frac{a^2}{b^2+c^2}$

40. $l^2+mn-6n^2=0$............(1)

$2l-m+3n=0$ ....(2)

$m=2l+3n$

$l^2+(2l+3n)n-6n^2=0$

$l^2+2ln-3n^2=0$

$l^2+3ln-ln-3n^2=0$

$(l+3n)(l-n)=0$

$(i)\, l=-3n$

$m=2l+3n$

$m=-3n$

$-3n:-3n:n$

-3 : -3 : 1

$\frac{-3}{\sqrt{19}},\frac{-3}{\sqrt{19}},\frac{1}{\sqrt{19}}$

$l_1 \quad m_1 \quad n_1$

$(ii)\, l=n$

$m=2l+3n$

$=2n+3n$

$l=5n$

$n:5n:n$

$\frac{1}{\sqrt{27}}:\frac{5}{\sqrt{27}},\frac{1}{\sqrt{27}}$

$l_2 \quad m_2 \quad n_2$

$|l_1l_2|+|m_1m_2|=\frac{3}{\sqrt{19}\sqrt{27}}+\frac{15}{\sqrt{19}\sqrt{27}}$

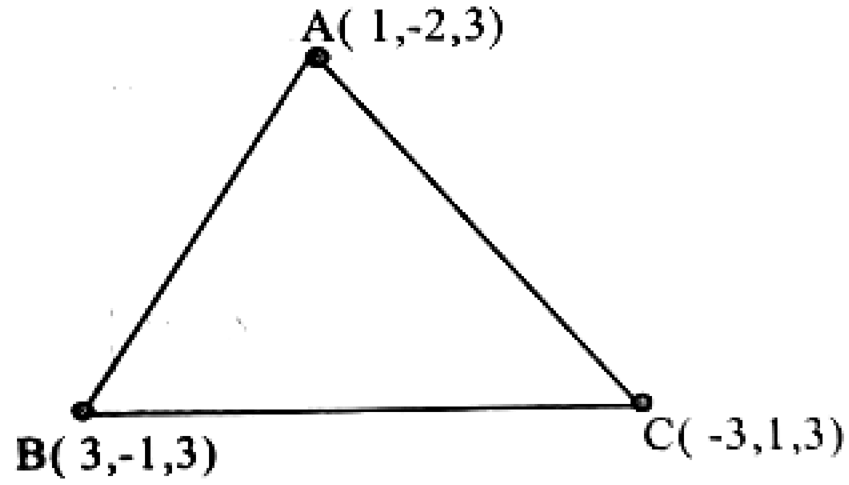
$=\frac{18}{\sqrt{19}\sqrt{27}}$

$=\frac{2\sqrt{3}}{\sqrt{19}}$

41. d.r of AB = 3-1, 1+2, -3-3

= 2,3,-6

Dc's of AB = $\frac{2}{7},\frac{3}{7},\frac{-6}{7}$



d.r of Ac = 1+3, -2-1, -3-3

= 4, -3, 0

d.c' of AC = 4/5, -3/5, 0/5

$\text{Cos}\, A=\frac{8}{35}-\frac{9}{35}=\frac{-1}{35}$

42. $\cos\beta = \cos\frac{\pi}{3} = \frac{1}{2}$,

$$\cos\delta = \cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$\cos^2\alpha + \frac{1}{4} + \frac{1}{2} = 1$$

$$\cos^2\alpha = 1 - \frac{3}{4} = \frac{1}{4}$$

$$1 - \sin^2\alpha = \frac{1}{4}$$

$$\frac{3}{4} = \sin^2\alpha$$

$$\sin\alpha = \frac{\sqrt{3}}{2}$$

43. $l - m + n = 0$ ....(1)

$$m = l + n$$

$$l(l+n) + (l+n)n - 4nl = 0$$

$$l^2 - 2nl + n^2 = 0$$

$$(l-n)^2 = 0$$

$$l = n$$

If

$$l = n$$

$$m = n + n = 2n$$

$$l : m : n = n : 2n : n = 1:2:1$$

$$d.c = \left(\frac{1}{\sqrt{6}}, \frac{2}{\sqrt{6}}, \frac{1}{\sqrt{6}}\right)$$

44.

a	b	c	
-1	1	1	-1
1	-2	2	1

$$\frac{a}{1} = \frac{b}{4} = \frac{c}{3}$$

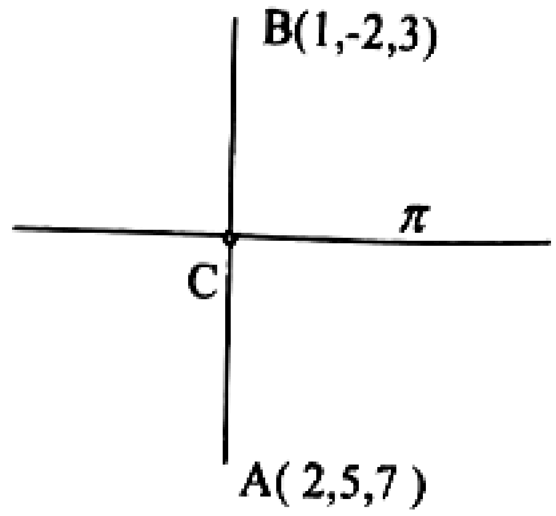
$dr's$ $\quad a:b:c = 1,4,3$

$d.c's$ $\quad \frac{1}{\sqrt{26}}, \frac{4}{\sqrt{26}}, \frac{3}{\sqrt{26}}$

45. A (2,5,7) , D (2,1,6)

C is the mid point of AB

$$C\left(\frac{2+1}{2}, \frac{5-2}{2}, \frac{3+7}{2}\right)$$



$$\left(\frac{3}{2}, \frac{3}{2}, \frac{10}{2}\right) = c\left(\frac{3}{2}, \frac{3}{2}, 5\right)$$

d.r. of $\overline{CD}$

$$2 - \frac{3}{2}, 1 - \frac{3}{2}, 6 - 5$$

$$\frac{1}{2}, -\frac{1}{2}, 1$$

$$1, -1, 2$$

d.c's $\quad \left(\frac{1}{\sqrt{6}}, \frac{-1}{\sqrt{6}}, \frac{2}{\sqrt{6}}\right)$

46. $AB = \sqrt{4+4+1} = 3$

$$AC = \sqrt{9+16+144} = \sqrt{169} = 13$$

$$AB : AC = 3:13$$

$$D\left(\frac{-3+52}{16}, \frac{-3+13}{16}, \frac{33+0}{16}\right)$$

$$D\left(\frac{49}{16}, \frac{10}{16}, \frac{33}{16}\right)$$

d.r's of $\overline{AD}$

$$\frac{49}{16}-2,\frac{10}{16}-3,\frac{33}{16}+1$$

$$\frac{49-32}{16},\frac{10-48}{16},\frac{33+16}{16}$$

$$(17,-38,49)$$

47. a – b + c = 0

b = a + c

$$a^2-b^2+2c^2=0$$

$$a^2-\left(a^2+c^2+2ac\right)+2c^2=0$$

$$c^2-2ac=0$$

$$c(c-2a)=0$$

$$c=0, c=2a$$

If c =0

b = a;

a : b : c = a : a : 0

=1 : 1 : 0

$$d.c=\left(\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}},0\right)$$

if $c=2a$

$b=3a$

$a:b:c=a:3a:2a=1:3:2$

$$dc's=\frac{1}{\sqrt{14}},\frac{3}{\sqrt{14}},\frac{2}{\sqrt{14}}$$

$$\cos\theta=\frac{1}{\sqrt{2}}\cdot\frac{1}{\sqrt{14}}+\frac{1}{\sqrt{2}}\cdot\frac{3}{\sqrt{4}}+0$$

$$=\frac{1}{\sqrt{28}}+\frac{3}{\sqrt{28}}=\frac{4}{\sqrt{28}}=\frac{4}{2\sqrt{7}}=\frac{2}{\sqrt{7}}$$

48. *Given* $A(1,-1,2), B(6,11,2), C(1,2,6)$

$AB\ drs=(5,12,0)$

$AB\ dcs=(l,m,n)=(\frac{5}{13},\frac{12}{13},0)$

$AC\ drs=(0,3,4)$

$AC\ dcs=(\frac{0}{5},\frac{3}{5},\frac{4}{5})=(l_2,m_2,n_2)$

$$\cos\theta=\left|l_1l_2+m_1m_2+n_1n_2\right|=\frac{36}{65}$$

49. By using Lagrange's Identify

$$\left(l_1m_2-l_2m_1\right)^2+\left(m_1n_2-m_2n_1\right)^2+\left(n_1l_2-n_2l_1\right)^2$$
$$+\left(p_1l_2+m_1m_2+n_1n_2\right)^2=1$$

50. $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

G.T $\alpha=\frac{\pi}{3}$, $\beta=\frac{\pi}{4}$

$$\cos^2\frac{\pi}{3}+\cos^2\frac{\pi}{4}+\cos^2\gamma=1$$

$$\frac{1}{4}+\frac{1}{2}+\cos^2\gamma=1$$

$$\frac{3}{4}+\cos^2\gamma=1$$

$$\cos^2\gamma=1-\frac{3}{4}$$

$$\cos^2\gamma=\frac{1}{4}=\left(\frac{1}{2}\right)^2$$

$$\cos^2\gamma=\cos^2\frac{\pi}{3}$$

$$\gamma=\frac{\pi}{3}$$

51. Cos $\alpha=\cos\beta=\cos\gamma$

$\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

$$\cos^2\theta=\frac{1}{3}$$

$$\sin^2\theta=2/3$$

$Tan^2\theta = 2$

$\text{Tan } \theta = \sqrt{2}$

52. $l+m+n=0$

$l=-m-n$

$Given\ lm=0$

$(-m-n)m=0 \Rightarrow m=0, m=-n$

$if\ m=0\ then\ l=-n$

$l:m:n=-1:0:1$

$(a_1,b_1,c_1)=(-1,0,1)$

If $m=-n$ then $l=0$

$l:m:n=\ 0:-1:1$

$(a_2,b_{2,}c_2)=(0,-1,1)$

$$\cos\theta=\frac{1}{\sqrt{2}.\sqrt{2}}=\frac{1}{2}$$

$$\theta=\frac{\pi}{3}$$

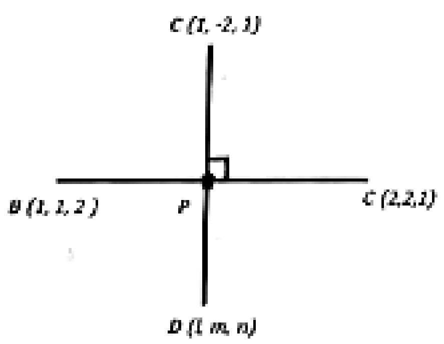
53. Conceptual

54. If θ is an angle between two lines whose d.r's $are(a_1,b_1,c_1)and(a_2,b_2,c_2)$

$$then\ \cos\theta\frac{a_1a_2+b_1+b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_2^2}\sqrt{a_2^2+b_2^2+c_2^2}}$$

55. Conceptual

56. B (1, 1, 2) C (2,2, 1)
Dr of BC is 1, 1, -1



Eqn of line BC is

$$\frac{x-1}{1}=\frac{4-1}{1}=\frac{z-2}{-1}=\lambda$$

$p(\lambda+1,\lambda+1,2-\lambda)$

Dr. of $\overline{CP}=\lambda,\lambda+3,1-\lambda$

Dr CP $\perp$ dr BC

$\lambda+3+\lambda+\lambda-1=0$

$\lambda=-2/3$

$$\therefore P\left(\frac{1}{3},\frac{1}{3},\frac{8}{3}\right)$$

'P' is mid point of CD

$$\frac{l+1}{2}=\frac{1}{3},\frac{m-2}{2}=\frac{1}{3},\frac{n+1}{2}=\frac{8}{3}$$

$$l=\frac{-1}{3},m=\frac{8}{3},n=\frac{13}{3}$$

$$\therefore l^2+m^2+n^2=\frac{1}{9}+\frac{64}{9}+\frac{169}{9}=\frac{234}{9}=26$$